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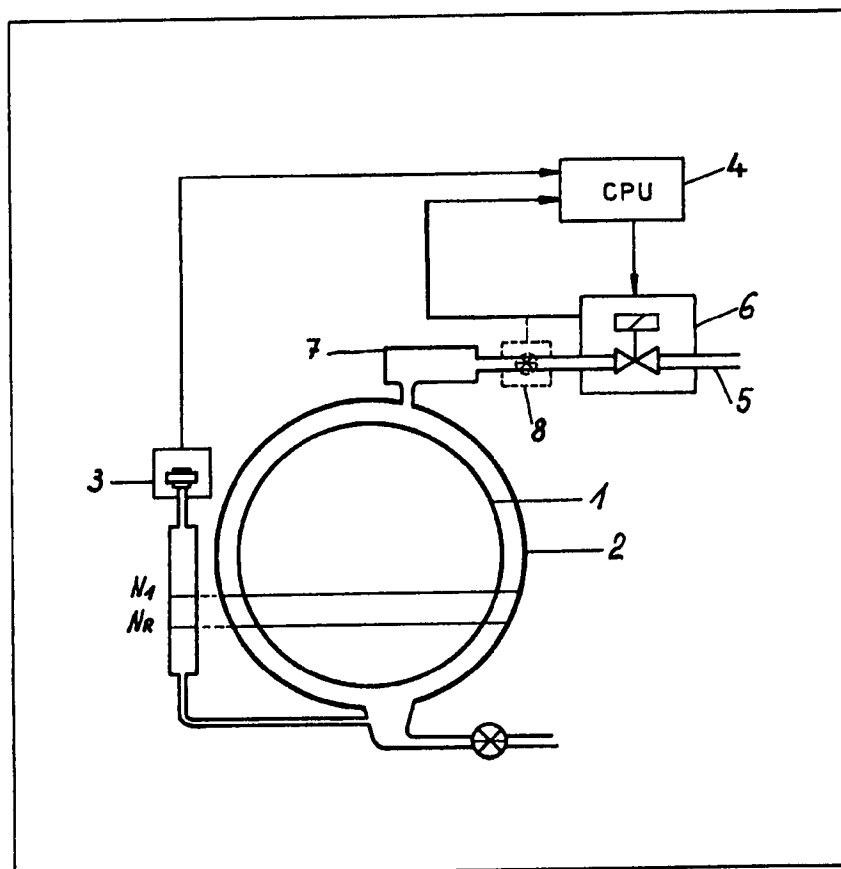
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(54) Washing machine

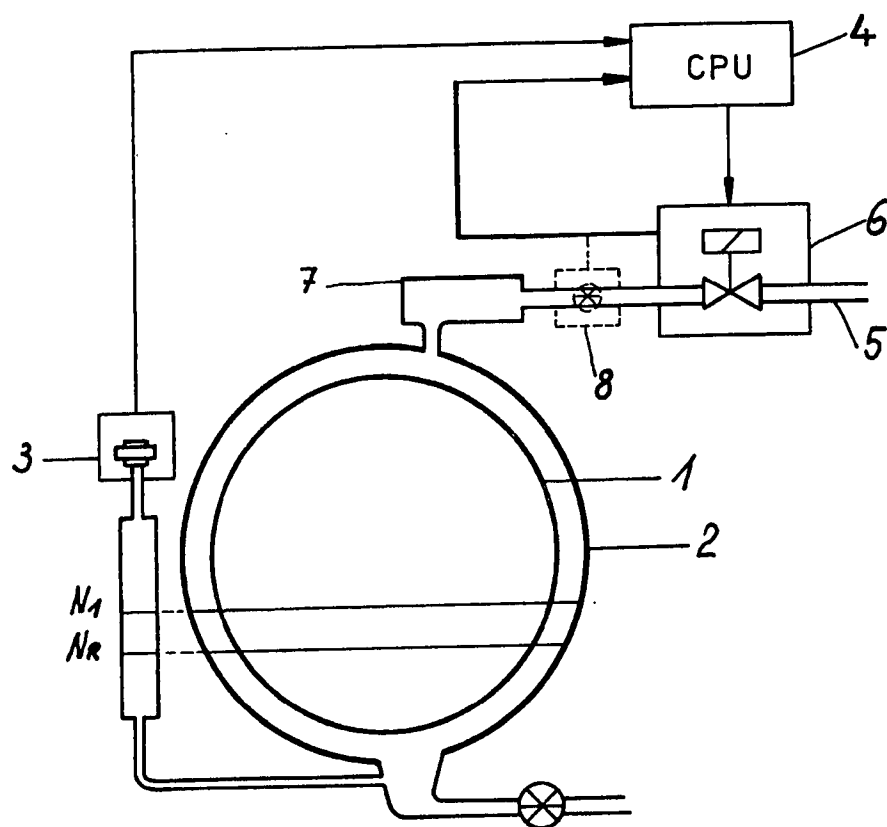
(57) The programme of an automatic washing machine is controlled according to the type of articles to be washed. The machine incorporates a pressure-operated control device 3 for measuring the water level in the machine and a magnetic valve 6 for controlling the water supply, which device 3 and valve 6 are connected to a central processor unit 4 which can thus determine the quantity of water supplied and determine the further program operations to be performed. In operation, for the pre-wash, water is supplied until the level reaches N_1 and the valve 6 closes. Reversing washing movement of the drum 1 commences so that the washing absorbs water dependent upon the absorbability of the fabric thereof. The water level

drops and, when it reaches level N_R , the valve 6 opens to restore it to the level N_1 . This re-filling may be repeated several times. The quantity of water supplied during the pre-wash constitutes a gauge for subsequent operations.



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SPECIFICATION

Method and arrangement for controlling the program of a washing machine

5 The invention relates to a method and an arrangement for controlling the program of a washing machine having a water level controlled water inflow.

10 In the field of washing machines it is the endeavour today to take into account the necessity of energy saving and also to reduce the energy consumption of the appliance and reduce the amount of water and detergents used.

15 It is nowadays customary, for example, to fit washing machines with a pushbutton for $\frac{1}{2}$ load, the selection of which establishes a program course with a reduced water level which permits economising in water and hence also electrical energy.

20 It has been found in practice that washing is not weighed before loading the machine, the housewife normally estimates the load by experience and by touch. Only in the most rare cases is the machine charged to 100% of its capacity. On an average a "full load" is between 3 kg and 4 kg in weight (related to a machine having a 4.5 kg capacity). This in turn results in the $\frac{1}{2}$ pushbutton only being depressed when the quantity of washing lies clearly below 50% e.g. at 1.5 kg. The housewife in fact is excessively catered for, if it is noted that it is not the weight of the wash but the absorbability of the wash which is decisive, which is explained by the following example:

25 If an extremely absorbent wash of, e.g. 2 kg in weight is charged and the water level reduced by depressing the $\frac{1}{2}$ pushbutton, then a bad rinsing result is certain to be obtained, since this wash has absorbed as much water as e.g. 4 kg standard wash load.

30 Despite these difficulties, however, there is a desire also to be able to wash part loads at favourable costs because in a normal household it is simply not possible always to collect a variety of types of laundry for a full machine load.

35 It has indeed already been proposed by means of weighing devices mounted in or on the washing machine to ascertain the weight of the washing and then to effect the program setting accordingly, but these proposals have the disadvantage that suitable weighing devices are bulky and costly and that the effect of the absorbability of the fabric is not taken into account.

40 Therefore the object of the invention is to provide a method and arrangement for controlling a program in a washing machine in which, automatically and depending on the absorbability of the item of washing to be washed, a program cycle may be carried out which is economical for energy, water and

detergent.

45 According to the present invention there is provided a method of controlling the program of a washing machine having a water level controlled water supply, wherein the water supply inflow at the beginning of the washing program is recorded directly or indirectly by measuring devices and in dependence upon this inflow supply switching actions to determine the further program course are taken, by means of which the water level and/or the number of subsequent washing or rinsing operations and the metering of the washing agents or detergents supplied can be effected.

50 Also according to the present invention there is provided an automatic washing machine having a water level controlled water supply, comprising a pressure-operated control device for monitoring the water level and a magnetic valve in the water inlet for controlling the water inflow, and wherein the switching impulses of refill operations are measured at the magnetic valve or at the pressure operated control device and supplied to a central processor unit of the program control device to determine the further program course to be taken.

55 The invention is based on the knowledge that in a water level controlled program cycle in a washing machine the quantity of water supplied constitutes a measure of the absorbability of the washing and with the same type of washing also a measure for the weight of the washing. The control of the inflowing water may be effected by direct or indirect measuring devices which via the central program control mechanism determine the further program course with regard to water supply and detergent metering.

60 The present invention will be described further, by way of example, with reference to the accompanying drawing which schematically illustrates an embodiment of the invention.

65 The drawing shows in a simplified view the inflow control of a drum washing machine with the various elements essential for explaining the invention.

70 A drum 1, for receiving the articles to be washed is mounted in known manner rotatable in a tank 2. A conventional pressure-operated control device 3 is provided as a water level controller, which is connected to a central processor unit 4 of the program control system.

75 Inflow of fresh water occurs via a feed pipe 5 in which a magnetic valve 6 is provided which receives its control commands from the central processor unit 4 of the program control system. The water supply paths of the system are shown in the drawings by way of simplified symbols, and the inflow is shown only via a detergent intake box 7.

80 The arrangement shown functions as follows:

85 Articles to be washed are loaded into the

drum 1 of the machine by the operator and the required program is started.

Conventional washing programs start with a preliminary wash. The magnetic valve 6 is opened and water begins to flow in until the switching point N_1 for the predetermined nominal level is reached, whereupon operation of the pressure-operated control switch 3 causes the closing of the magnetic valve 6 and at the same time the washing movement of drum 1 commences. This reversing drum movement causes the washing to become increasingly dampened and it absorbs water dependent upon the absorbability of the type of fabric involved. This causes the water level in the tank to drop until, upon reaching the reconnection point N_2 , the magnetic valve 6 is reopened to restore the water level to the nominal level N_1 . This refilling operation may be repeated several times depending upon the absorbability of the articles for washing.

Consequently, the quantity of water supplied at the beginning of the washing program will constitute a gauge which characterises the absorbability of the articles for washing and with an identical type of fabric also the weight of the washing.

Ascertaining the quantity of water supplied may be effected in a variety of ways by direct or indirect measured value assimilation. The central processor unit 4 is supplied with switching impulses characterising the supplied quantity of water, so that, in accordance with the information received, switching actions determining the further washing program may be programmed. More especially, the water level of the subsequent wash and the water level or the number of rinses to be performed may be automatically adapted to the properties of the articles for washing. Furthermore, it is possible to influence the metering of the detergent in the same manner.

A simple possibility of obtaining data regarding the inflow of water is to record the number of refill operations, and this may be effected by counting the switching impulses at the magnetic valve 6, or these refill impulses may also be monitored at the pressure-operated control device 3.

Furthermore, the switching-on time of the magnetic valve 6 is presented for the measured value assimilation which, relatively independently of the mains pressure, supplies a constant flow quantity per time unit.

Moreover, as indicated in the drawing by dotted lines, a small water meter 8 may be located in the feed path, which meter 8 emits an impulse per quantity unit.

The use of the above-described control system is favourable especially in an electronic program control system, since in the central processor unit (CPU) 4 the signal of the pressure monitor 3 is in any event processed and activation of the magnetic valve 6 is controlled by the CPU 4. Thus by simple

programming it is possible e.g. to monitor and store the number of refill operations, and in accordance with the further program to control the water consumption and the detergent metering.

A similar control system may also be introduced into electro-mechanical program switching mechanisms without undue difficulty. An electronic metering system, for example, is additionally necessary which controls the number of refill operations and permits the rinsing operations to be adjusted by moving onto various transfer sections.

When controlling the refill operations it may be significant under certain circumstances to use a pressure-operated control device 3, which has an extremely low switching difference, in the washing machine having the above control arrangement.

CLAIMS

1. A method of controlling the program of a washing machine having a water level controlled water supply, wherein the water supply inflow at the beginning of the washing program is recorded directly or indirectly by measuring devices and in dependence upon this inflow supply switching actions to determine the further program course are taken, by means of which the water level and/or the number of subsequent washing or rinsing operations and the metering of the washing agents or detergents supplied can be effected.

2. A method according to claim 1, in which as a measure of the water supplied at the beginning of the program, the number of refill operations is recorded.

3. A method according to claim 1, in which the switching-on time of a magnetic valve, having an almost constant flow quantity per time unit, is monitored and hence information concerning the inflowing water supply is provided.

4. A method according to claim 1, in which a water meter is provided as a measuring device for the quantity of water supplied which water meter provides a metering pulse per unit of water supplied.

5. An automatic washing machine having a water level controlled water supply, comprising a pressure-operated control device for monitoring the water level and a magnetic valve in the water inlet for controlling the water inflow and wherein the switching impulses of refill operations are measured at the magnetic valve or at the pressure-operated control device and supplied to a central processor unit of the program control device to determine the further program course to be taken.

6. A washing machine as claimed in claim 5, wherein the switching-on time of the magnetic valve, having an almost constant flow quantity, is measured by the central processor unit.

7. A washing machine as claimed in claim 5 or 6, wherein in the supply path of the washing machine a water meter is provided which emits an impulse per supply unit.
- 5 8. A washing machine as claimed in any of claims 5, 6 or 7, wherein the pressure-operated control device controlling the water level, has a low switching difference.
- 10 9. A method of controlling the program of a washing machine substantially as herein described.
- 15 10. An automatic washing machine substantially as herein described with reference to and as illustrated in the accompanying drawings.

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